ASSIMILATIVE CAPACITY OF BAXTER CREEK

Village of Millbrook
County of Peterborough

1975

Ministry of the Environment
Ontario

P. G. Cockburn, P. Eng.
Regional Director
Central Region

MINISTRY OF THE ENVIRONMENT

CENTRAL REGION

ASSIMILATIVE CAPACITY OF BAXTER CREEK

RE:

PROPOSED SEWAGE TREATMENT FOR

VILLAGE OF MILLBROOK

COUNTY OF PETERBOROUGH

by: A. V. Choo-Ying

1975

TABLE OF CONTENTS

SUMMARY

Baxter Creek has sufficient flow to accommodate effluent from the proposed sewage treatment plant in Millbrook.

Based on effluent quality, various loads can be satisfactorily assimilated without seriously affecting water quality in the stream. For example, for an effluent with a BOD concentration of 15 mg/l, a daily BOD_5 load of 79 lbs. can be accommodated without elevating the downstream BOD_5 level above 4 mg/l.

There is evidence of fecal bacterial contamination in Baxter Creek below Millbrook, and since the stream is used for body-contact recreation, this type of contamination warrants consideration to control excessively high levels.

RECOMMENDATION

An intensive 48-72 hour monitoring program should be conducted when the proposed sewage treatment plant has been built and put in operation, to asses more fully the assimilative capacity of the stream. Technical Support Section has included this in our list of projects for future consideration.

INTRODUCTION

This report is written in response to a request from the Peterborough District Office (letter dated January 14, 1975). The proposed sewage treatment plant will provide secondary treatment with phosphorus removal, and effluent discharge to Baxter Creek will be continuous. (The site of the proposed plant has not yet been selected). The predicted parameters for sewage effluent quality were provided by Mr. B. Howieson, M.O.E. - Peterborough.

No population limit was provided in the correspondence received; thus the capacity of the stream to assimilate sewage will be based solely on maintaining a BOD_5 concentration of not more than 4 mg/l downstream of the sewage outfall.

HYDROLOGY

Spot measurements of flow at Station 02HJ103 on Baxter Creek at Fraserville have been taken by Ministry staff since 1970. Measurements are taken only during the open-water period.

Using Station 02HD003 on the Ganaraska River at Osaca as the index station, the estimated low flows for Baxter Creek at Fraserville (drainage area = 29 mi^2) are as follows:

1 Q 10*	=	9.5 c.f.s.
1 Q 20	=	8.0 c.f.s.
7 Q 10	=	10.7 c.f.s.
7 Q 20	=	9.0 c.f.s.

For Baxter Creek below Millbrook having drainage area of 21 $mi.^2$, the corresponding estimated discharges based solely on basin size are:

* One-day minimum discharge for a recurrence interval of 10 years.

Cont'd

1 Q 10 = 6.9 c.f.s.
1 Q 20 = 5.8 c.f.s.
7 Q 10 = 7.7 c.f.s.
7 Q 20 = 6.5 c.f.s.

Stream flow in Baxter Creek at Station 02HJ103 is regulated by several upstream dams; however, the amount of regulation appears to be small since the dams are either used for recreation or are abandoned. Therefore, flows in Baxter Creek, for this project, will be classified as un-regulated.

WATER USE

There are no water extractions from Baxter Creek according to our water taking permit files. Stream flow is used primarily for recreation and for fishery. The Ministry of Natural Resources has been planting rainbow trout in this stream and suspects there may be also some speckled trout in it.

WATER QUALITY

Water quality data for Baxter Creek, 1.5 miles downstream of Millbrook have been collected since 1965. The data indicate generally satisfactory water quality. The following are values for some water-qualtiy parameters for 1973 (9 & 10 measurements) which probably reflect present conditions.

Parameter	Unit	Maximum	Median	Minimum
Total Coliform	/100 ml	688	420	44
Fecal Coliform	/100 ml	428	72	1
Fecal Strep.	/100 ml	152	8	1
Dissolved Oxygen	mg/l	14.5	11.0	1
BOD	mg/l	10.0	1.2	0.6
Total "P"	mg/l	0.085	0.050	0.025
Total Kjeld.(As N)	mg/l	0.60	0.33	0.27

The above indicates some bacterial contamination.

Cont'd

ASSIMILATIVE CAPACITY

The assimilative capacity, as calculated, is based solely on a maximum desirable BOD concentration of 4 mg/l in stream water below the sewage outfall. For computation purposes, the effluent is assumed to have BOD concentrations ranging from 15 mg/l to 30 mg/l in increments of 5 mg/l, and the design flow will be taken as 2/3 the 7 Q 20. The 2/3 value is used to allow for contingency problems.

Based on the above, the allowable effluent and BOD loads are:

BOD concentration mg/l	Allowable Discharge m.g.d.	(c.f.s.)	Allowable BOD Load lbs.
15	0.53	(0.98)	79
20	0.36	(0.67)	72
25	0.27	(0.51)	69
30	0.22	(0.41)	66

CONCLUSION

Baxter Creek has sufficient flow to assimilate treated waste from the proposed sewage treatment plant, when the plant's effluent falls within the limits of BOD concentration and allowable discharge as defined above.

The BOD_5 loads as indicated should be closely adhered to, to avoid serious degradation of the stream which supports a cold-water fishery and is used extensively for recreation.

Cont'd

Report By: .....

A. V. Choo-Ying, P. Eng.
Hydrologist

Approved By: .....

W. Lammers, P. Eng.
Chief
Water Resources Assessment

APPENDIX I

Sample Calculation

To determine (1) Sewage Effluent Discharge Rate, Qs(cfs)

(2) BOD_5 Load, L (lb)

Design Flow = 2/3 x 7Q20
= 2/3 x 6.5 c.f.s.
= 4.3 c.f.s.

BOD_5 conc. in stream flow = 1.5 mg/l (assumed)
BOD_5 conc. in effluent = 15 mg/l (assumed)

Using Mass-Balance Equation

(4.3 cfs x 1.5 mg/l x 5.4) + (Qs x 15 mg/l x 5.4)
= (4.3 + Qs) (4 mg/l x 5.4)

Qs = 0.53 mgd (0.98 cfs)

L = 0.98 cfs x 15 mg/l x 5.4

= 79 lbs.